



Bibliothèque,
Le Séminaire de Québec,
3, rue de l'Université,
Québec 4, QUE.

MONTREAL NORTHERN COLONIZATION RAILWAY

GENERAL SPECIFICATION

FOR THE

Construction of the Work.



THE UNIVERSITY OF CHICAGO

LIBRARY

Constitution of the World

GENERAL SPECIFICATION FOR THE CONSTRUCTION OF THE WORK.

1st. This specification refers to all works of construction required in making and building the railway known as The Montreal Northern Colonization Railway, from the harbor at the eastern end of the city of Montreal, to some suitable point of crossing the Back River above or in the neighborhood of Vinet's Bridge, at or in the neighborhood of Porteous crossing, via Ste. Rose, Ste. Thérèse, Grenville and Hull, to the Village of Aylmer, all in the Province of Quebec, a total distance of about one hundred and twenty-eight miles, more or less, together with a branch line from Ste. Thérèse to St. Jérôme, of fourteen miles in length, more or less. It comprises clearing, close cutting, grubbing, fencing, excavation, embankments, draining, ditching, foundation works, bridge and culvert masonry, bridge superstructure, cattle guards, road and farm crossings, permanent way and ballasting, with rolling stock, a line of telegraph, with wire, posts, insulators and necessary apparatus for telegraphing, and all other works connected with the construction and completion of the line of the railway, together with land purchase, station freight and engine houses, wood sheds and water tanks, with the exception of the station buildings and station grounds at the city of Montreal. The intention being that the contractors shall complete the road, with the above exceptions, in a manner equal, in every respect, to a first class railway, such, for instance, as the Great Western R. railway of Canada.

WIDTH OF LAND REQUIRED.

The width of land required to be taken for the railway will be eighty feet, to furnish room for a double track when required — at certain points an additional quantity may be required to accommodate increased cuttings, and embankments, or for borrowing pits, or for gravel pits. Extra quantities will also be required at the various stations to furnish sites for the buildings, sheds, sidings and fuel ground. The extra quantity so required, in either or all of the foregoing cases, will be determined and marked off by the engineer.

2. Where the railway passes through wooded sections, the land must be cleared to the width of forty feet, on each side of the centre line, or to such greater or lesser width as the engineer shall direct; large trees existing exterior to the space cleared, and which might endanger the track by falling on it, will be cut down.

3. The clearing is to be done so that all the brush, logs, and other loose materials within its limits will be burnt — a sufficient quantity of fencing stuff, or suitable timber for ties, or other valuable wood may be reserved, cut into suitable lengths, and piled in such places as may be pointed out. The Contractors may also cut into cord wood such timber as may be suitable for the purpose, and pile the same in such places as may be directed by the engineer for safety from fire.

In no case shall any of the brush or logs be cast back upon the adjacent timber land; they must invariably be made into piles near the centre of the space to be cleared, and then entirely consumed; all brush or trees accidentally or otherwise thrown into the adjacent woods must be dragged out and burned. The land, when cleared, must be left in a clean condition. The Contractors are to remove all wood and stone fences from within the railway limits, at their own cost.

CLOSE CUTTING.

4. Where embankments are to be formed, less than four feet, and more than two feet in height, all the standing timber and stumps must be chopped close to the ground, within the limits of the embankment, and burnt, but where the embankment exceeds four feet in height, chopping as for ordinary clearing will be allowed. In wet, swampy places, brushwood not less than eighteen inches in thickness must be properly laid as directed, to form foundations for the embankments, and in specially soft places, the base of the embankment will be formed of round cedar or tamarack, twenty-five feet long, and not less than eight inches diameter at the smaller end, laid close together, transversely with the line of the railway, and these overlaid with brushwood, placed lengthwise of the railway, having an average thickness of eighteen inches, and a uniform width of twenty feet.

5. Where excavations will not exceed three feet in depth, or embankments two feet in height, all stumps must be grubbed out, and if possible, burned; those that will not burn, must be carried beyond the limits of the cuttings and embankments, where directed, and then piled. The space to be occupied by side ditches will also be grubbed. Directions will be given at the proper time, as to the extent required to be cleared, close cut and grubbed.

FENCING.

The fencing will be of two kinds—1st. that known as post and board fence; and 2nd. rail fence with pickets and sills; each to be built as hereinafter described. The engineer shall decide the kind of fence to be used in the various localities, but for the most part, the rail fence will be used.

1st. Post and Board Fence—This fence to consist of cedar posts not less than five inches in their least dimensions, and eight feet six inches long, planted three feet six inches in the ground and well packed

and rammed; the posts to be placed at intervals of from six to eight feet apart.

The boards to be of inch pine, (second quality,) hemlock or basswood, of the respective widths of twelve, ten, eight and six inches; each board to embrace two panels, and only two joints to occur on any post. The boards to be secured to the posts by three inch cut nails, six to each, and over the joints of the boards a ribbon of one inch pine, &c., three inches wide is to be properly nailed by four four inch cut nails, the ribbon to extend to the top of the post, and this fence to consist of four boards spaced as directed. The top of the posts to be cut off uniformly. In rocky ground where the posts cannot be let in sufficiently deep, posts five feet six inches long to be used, and tenoned into sills four feet long, twelve inches wide and six inches thick, the tenons to be wedged on the underside of the sill, upon which will be properly fixed a spur or strut; the strut to be not less than three inches thick. The boards will be used as before mentioned as also the nails. The posts sills and struts must be of cedar.

2nd Class. This will consist of two posts to each panel, and a cap and sill which must in all cases be made of cedar. The six rails properly spaced with sawn square cedar blocks between each, securely fitted so as to raise the fence to the height required, the rails in all cases to be straight and sound; these may be made of suitable black ash, tamarack or cedar timbers, thirteen feet long and not less than four inches thick, or of a sectional area of twelve inches, sills to be four feet long, ten inches wide and six inches thick, and bored to receive posts, with a three inch augur. The caps to be two feet four inches long, eight inches wide and five inches thick, bored in same manner as sills. The posts or pickets to be of the necessary height required for each township, and to be not less than four inches in their least dimensions, or of a sectional area of fourteen inches, the ends to be neatly prepared and fitted truly to the mortices in the caps and sills. The posts to be

placed ten inches apart in the clear at the bottom, and eight inches in the clear at the top.

In all cases, the fencing must be built in strict accordance with the requirements of the by-laws of the respective townships and parishes in which the same are fixed, and must be kept uniform as to height and appearance, all stones, roots and other obstructions to be removed, and the ground properly levelled to receive the sills. All timber must be sound and suitable in all respects; all holes and depressions under the lower rail that would admit small animals must be stopped up, with earth, stones, or blocks of wood. The farm gates will be light and strong of an approved design, similar to those on the Great Western Railway; they will be finished complete with proper fastenings, and receive two coats of white paint, or one coat of tar. Wherever bars are required for owners as directed by the engineer, strong and durable posts shall be set, and the rails of the fence shall be morticed firmly into them: good substantial bars shall be made to enter mortices in the same posts. At all public crossings the fence shall be carried at right angles with the railway to the respective ends of each cattle guard.

The Contractors will be required to take immediate steps to construct the fence along the line, or at such places as the engineer shall direct, and shall complete the whole with as little delay as possible.

CATTLE GUARDS.

7. Cattle Guards of wood or stone according to plans to be furnished by the engineer, shall be placed at all the level crossings.

OCCUPATION CROSSINGS.

8. Where side ditches occur at farm or occupation crossings, in the line of the gateways or bars, suitable bridges will be placed over the ditches, on either side of the track. These bridges may be made with a flooring of three-inch plank, supported on cross-

stringers of timber, and spiked or pinned thereto; or flatted timber may be used in place of the planks, and properly secured to the stringers, as the engineer may direct. At such places, where embankments or cuttings of the roadway occur, the approaches to the same from the occupation bridges will be graded in accordance with the directions of the engineer, so as to permit of an easy crossing of the railway being obtained.

PUBLIC ROAD CROSSINGS.

9. At public road crossings, the approaches to the railway will be graded either in embankments or cuttings, to comply with the municipal requirements; suitable culverts for drainage, either across the railway or the public roads, will be constructed, in such manner as the engineer may direct; "Railway Crossing" sign-boards will also be erected at the intersection of the railway with each public road, in the same manner as on the Great Western Railway.

At certain places the line of the railway will be carried over the ordinary road by a bridge, or, on the other hand, the ordinary road may be carried over the railway by a bridge, ample space being left for the passage of locomotivss or ordinary vehicles in either case.

GRADING.

10. In woodland the grading will not be commenced until the clearing, close cutting and grubbing required be completed, to the satisfaction of the engineer; and the contractors will be held responsible for all damage to crops.

11. The width of embankment at sub-grade or formation level is intended to be fifteen feet; the width of cuttings, as a general thing, will not be less than twenty feet, but they may vary according to the section of the country and other circumstances, as the engineer may direct; at stations and turn-outs the grading will be executed for a double track, of say thirty feet in width the entire length of the sidings

required, and also for any additional siding accommodation in connection with freight or wood sheds as may be indicated by the engineer. The slopes of earth work will be made one and a half horizontal to one perpendicular. In rock cuttings, should such occur, the slopes as a rule one horizontal to four perpendicular. In cuttings or embankments of sand slopes to be two feet horizontal to one perpendicular. In cuttings partly earth and partly rock, a berm of six feet shall be left on the surface of the rock. The widths, slopes and other dimensions above defined may be varied by the engineer at any time to suit circumstances.

12. The material to be placed in the embankments must be approved by the engineer, and in places where the natural surface of the ground upon which the embankment is to rest is covered with vegetable matter, which cannot be burned off in clearing, and which would, in the opinion of the engineer, impair the work, the same must be removed to his entire satisfaction.

All sloping ground covered with pasture shall be deeply ploughed over the base of the embankments, before the latter are commenced.

13. All side hill ground to be covered by embankments shall first be thoroughly underdrained, as the engineer may see expedient, and all cuttings after being formed, and all slopes likely to be affected by wet, must be similarly underdrained, longitudinally or transversely, or both, as circumstances may seem to him to require. These drains will be constructed in a similar way to that in which ordinary land drains are sometimes made: a trench will first be dug to a depth of four feet on an average, and barely wide enough for a man to stand. In the bottom of this trench three or four cedar or spruce poles, from two to three inches diameter, will first be laid by hand, and breaking joints; over the poles will then be placed two feet of coarse gravel or broken stones, not larger than ordinary road metal, over which will be placed a coating of brush, and then the trench will be filled up to the surface of the ground with such material

convenient to the place as the engineer may approve of. The Contractors must find all the material required in these drains, do all the work described, and remove the surplus earth. These drains must always be made with a sufficient longitudinal fall for the easy flow of the water, and therefore may, in level cuttings be deeper at one end than at the other; but the average depth in all cases may be considered four feet.

14. On the completion of the cuttings and the underdrains provided for in last clause, ditches for the removal of surface water shall be formed along each side at the bottom of the slopes, according to the directions to be given—catch-water ditches shall also be formed some distance back from the top of slopes to exclude from the excavation any water flowing from the adjoining lands; the contractor shall also construct all other drains and ditches which the engineer may deem necessary for the perfect drainage of the railway and works.

15. All open ditches in cuttings and elsewhere, and all excavations required for turning, making, or changing water courses, other than the underdrains above mentioned, the formation of public roads, grading depot grounds, branches or turnouts, and foundation pits for masonry must be excavated as may be from time to time directed, and the material deposited as ordered by the engineer.

16. The embankments must be made to such sufficient height and width as will allow for the subsidence of the same, and both cuttings and embankments shall be left at the completion of the contract at such heights, levels and forms as directed by the engineer.

17. The whole of the grading shall be carefully formed to the levels given, and the roadway in cuttings shall invariably be rounded and left from 6 to 8 inches lower at the sides than on the centre line. In rock cuttings it will be sufficient to form a water channel about two feet wide, and eight inches deep along each side. All materials found in excavations

whether in road bed, cuttings, ditches, water channels, road crossings, borrowing pits or elsewhere, must be deposited in such places as the engineer may direct. In cases where the road-bed excavations are insufficient to form the embankments, the deficiency shall be supplied by widening the cutting, or from side ditches along the railway or from borrowing pits, but no material shall be so supplied without his concurrence, and not until the cuttings are completed, without his express directions. All borrowing pits shall, if required by the engineer, be dressed to a good shape and properly drained. Where material to make embankments is taken from side ditches, a berm of at least five feet on one side, and twenty feet on the opposite side from the bottom of slope of embankment, shall remain untouched. The side ditches shall be excavated with the declivities for carrying off the water and with sides properly sloped, of not less than a foot and a half horizontal to one foot vertical of the depth. All stumps, roots and stones which would obstruct the free flow of the water must be removed therefrom. Ditches leading from the various culverts will be excavated to the side ditches, to admit the water to freely pass from one side of the railway to the other.

13. Where the excavation in a cutting exceeds what may be required to make the embankments of the specified width, the engineer may direct that the embankments be increased in width with the surplus material; when this is done to his satisfaction, the remainder, if any, may be wasted; but in every case where either borrowing or wasting is resorted to, the material must be taken and deposited as he may regulate and direct. Where the material in cuttings is of gravel fitted for ballasting, the engineer may direct such portion of the side slopes to remain unfinished, as he may think proper, in order to reserve it for ballasting the road when the permanent track is laid. In such cases the material required for making the adjacent embankment may be taken from side ditches or borrowing pits. When such occurs

however, the road-bed for the track will be graded for its reception in the usual manner.

19. In cases where pitching or rip-rapping will be required for the protection of embankments contiguous to streams, all stones suitable for this work found in excavations may be removed and deposited in some convenient place, until required; and all good building stone which may be found in rock excavations may, with the approval of the engineer, be preserved and used in masonry.

20. Rip-rap work, whenever required and ordered for the protection of slopes of embankments, must be well and carefully performed, in such manner and of such thickness as may be directed.

21. Roads constructed to and from any point on the line of railway, for the convenience of the Contractors, for the conveyance of material or otherwise, must be at their own risk, cost, and charges.

22. Whenever the line is intersected by public or private roads, the Contractors must keep open, at their own cost, convenient passing places, and they shall be held responsible for keeping all crossings during the progress of the work, in such condition as will enable the public to use them with perfect safety, and such as will give rise to no just ground of complaint. Contractors will be held liable for any damages resulting from negligence on their part, or that of their men.

23. Where slips occur in cuttings, after they are properly formed, the material must be immediately removed by the contractors, the slopes reformed, and such precaution adopted as the engineer may deem necessary, the whole work being done at the expense of the Contractors.

24. In forming embankments great care must be taken to place against the backs of all walls exposed to the action of the frost, three feet in thickness or any greater thickness that the engineer may direct, of rip-rap backing, consisting of small stones blinded

with spalls or coarse gravel, to prevent the retention of moisture, and the action of frost thereon—and in forming embankments between wing walls, against abutments of bridges, viaducts or culverts, and over arches, the earth filling must be carefully packed or punned in thin layers, and a proper quantity of material must be carefully placed equally against each side of, and over all bridges, culverts or other work, before the embankment approaches it, and in forming embankments, the greatest care must be observed, and every precaution must be taken, to load the masonry of structures evenly.

25. In the event of the earth excavation being proceeded with in winter, no snow or ice must be placed in embankments, or allowed to be carried up in them, and all frozen earth must be excluded from the heart of the embankments.

26. The Contractors shall, at their own cost, before the work is finally accepted, finish up cuttings and embankments, dress and drain borrowing pits when required, dress slopes to the required angles, repair all damages by frost or other causes, and complete everything connected with the grading of the road bed, bridging, &c., in a creditable and workmanlike manner, in accordance with the directions, and to the satisfaction of the engineer.

FOUNDATIONS.

27. Foundation pits must be sunk to such depths as the engineer may deem proper for the safety and permanency of the structure to be erected; they will in all cases be sunk to such depths as will prevent the masonry being acted on by the frost. The material therefrom will be deposited in embankment, unless the engineer direct otherwise: whenever timber or other artificial foundations may be found expedient, the pits will be made of sufficient dimensions to admit them without difficulty. Where rock foundations exist, for the abutments and piers of bridges, and beam culverts, the rocky bed will be

properly excavated and levelled off for the reception of the masonry, as the engineer may direct.

28. No masonry shall be commenced in any foundation pits, before they have been inspected and approved by the engineer, and they must be kept free from water, by suitable cofferdams during the progress of the work, until the masonry is brought above the level of the surface.

29. Foundation timbers, when required, will be of such dimensions, and of such kinds as the engineer may direct. The timber employed will be tamarack, hemlock, black spruce or pine, and planks from three to six inches, or timber flatted on two sides only, and ranging from six inches to twelve inches thick. The faces of the flattened timber will at least measure as much as its thickness, and the bark will be removed from the sides not flattened.

30. All spikes, bolts, straps, or other iron work found necessary to be used in timber foundations, or in the wooden superstructure of beam culverts or short span bridges, must be of the best quality of iron usually employed for similar purposes.

31. Whenever the engineer may direct piling to be done, the timber shall be in every respect sound, and of such description as he may approve; where he thinks it necessary, trial piles shall first be driven.

32. The piles shall be carefully and truly pointed, shod and hooped with iron as may be directed, they shall be driven to any depth the engineer may deem expedient, and the weight of the ram, as well as the fall, shall be such as he may consider necessary. The greatest care must be taken to drive the piles plumb, or battered in such positions and distances apart as he may direct. A pile that may be damaged or too short, or out of line when driven, shall be taken up and replaced by another; the heads of piles must not be injured in driving.

33. Whenever concrete is employed, it will be composed of hydraulic lime, clean sharp sand, and

good gravel of approved quality and proportion. The proportion of sand and lime will be the same as in mortar, and in making the concrete, a sufficient quantity will be used with the gravel to fill up every interstice, and render the mass when set, perfectly solid and compact.

MASONRY.

34. All the masonry must be of a substantial and permanent character, made of durable and suitable materials, and in every respect equal to the best description of masonry in railway works.

35. The masonry shall not be started at any point before the foundation has been properly prepared; nor until it has been examined and approved by the engineer, nor until the Contractor has provided a sufficient quantity of proper materials and plant to enable the work to be proceeded with regularly and systematically.

36. Hydraulic lime mortar will be used unless otherwise directed, in building all masonry, from the foundations up to a line two feet above the ordinary level of the stream, it will also be used in turning arches, in laying girder beds, copings, covering of walls generally, and in lipping and in pointing. The hydraulic lime or concrete must be fresh ground, of the best brand, and it must be delivered on the ground and kept till used in good order. Before being used, satisfactory proof must be afforded to the engineer of its hydraulic properties, as no inferior cement will be allowed.

37. Lime mortar must be made of the best common lime, and will be employed in all masonry (except dry,) where cement is not directed to be used.

38. Both cement and lime must be thoroughly incorporated with approved proportions of clean, large grained, sharp sand. The general proportions may be one part of lime to two parts of sand, but this may be varied according to the quality of the

lime or cement. Mortar will only be made as required, and it must be prepared and used under the immediate direction and to the satisfaction of an inspector, by the Contractor's men, failing which the inspector may employ other men to prepare the mortar, and any expense incurred thereby shall be borne by the Contractor. Grout shall be formed by adding a sufficient quantity of water to well tempered and well proportioned mortar.

39. The stone used in all masonry on the line of railway must be of durable character, large, well proportioned and well adapted for the construction of substantial and permanent structures.

40. The masonry will be classified as follows:—

First class masonry	- - - - -	in cement
" " "	- - - - -	" common lime
Second class "	- - - - -	" cement
" " "	- - - - -	" common lime
" " "	- - - - -	" dry

41. *First class masonry* shall be in regular courses of large, well shaped stone, laid in mortar on their natural beds; the beds and vertical joints will be hammer-dressed, so as to form quarter-inch joints. The vertical joints will be dressed back square nine inches; the beds will be dressed perfectly parallel throughout. The work will be left with the "quarry face," except the outside arises, ice-breakers, string and coping, which will be chisel-dressed.

42. The courses of first class masonry will not be less than twelve inches, and they will be arranged in preparing the plans to suit the nature of the quarries. Courses may range to twenty-four inches, and the thinnest courses invariably be placed towards the top of the work.

43. Headers will be built in every course not farther than six feet apart; they will have a length in line of wall of not less than twenty-four inches, and they must run back at least two and a half times their height, unless where the wall will not

allow this proportion, in which case they will pass through from front to back. Stretchers will have a minimum length in line of wall of thirty inches, and their breadth of bed will at least be one and a half times their height. The vertical joints in each course must be arranged so as to overlap those in the course below ten inches at least.

44. The quoins of abutments, piers, &c., shall be of the best and largest stone, and have chisel drafts properly tooled on the upright arris from two to six inches wide, according to the size and character of the structure.

45. Coping-stones, string-courses and cut-waters shall be neatly dressed, in accordance with the plans and directions to be furnished during the progress of the work.

46. The bed-stones for receiving the superstructure shall be of the best description of sound stone, free from dries or flaws of any kind; they must be not less than twelve inches in depth for the small bridges, and eight feet superficial area on the bed. The larger bridges will require bed-stones of proportionately greater weight; these stones shall be solidly and carefully placed in position, so that the bridge will sit fairly on the middle of the stones.

47. The backing will consist of flat bedded stone, well shaped, having an area of bed equal four superficial feet or more. Except in high piers or abutments, two thicknesses of backing stone, but not more, will be allowed in each course, and their joints must not exceed that of the face work. In special cases, where deemed necessary by the engineer to ensure stability, the backing shall be in one thickness; the beds must, if necessary, be scabbled off, so as to give a solid bearing. No pinning will be allowed. Between the backing and face stones there must be a good square joint not exceeding one inch in width, and the face-stones will be scabbled off to allow this. In walls over three feet in thickness, headers will be built in front and back walls

alternately, and great care must be taken in the arrangement of the joints, so as to give perfect bond.

48. Every stone must be set in a full bed of mortar, and beaten solid; the vertical joints must be flushed up solid, and every course must be perfectly level and thoroughly grouted.

49. *Second class masonry* shall be built of good, sound, large, flat bedded stones, laid in horizontal beds. It may be known as random work, or broken coursed rubble. The stones employed in this class of masonry will generally be not less in area of bed than three superficial feet, nor less in thickness than eight inches, and they must be hammer-dressed, so as to give good beds with half-inch joints. In small structures, and in cases where stones of good size and thickness cannot be had, they may, if in other respects suitable, be admitted as thin as five inches. All stones must be laid on their natural beds.

50. Headers must be built in the wall from front and back, alternately, at least one in every five feet in line of wall, and frequently in the rise of wall. In the smaller structures headers shall not be less than twenty-four inches in length, and the minimum bed allowed for stretchers shall be twelve inches. In the larger structures all stones must be heavier in proper proportion. Every attention must be paid to produce a perfect bond, and to give the whole a strong, neat, and workmanlike finish.

51. Wing walls will generally be furnished with steps, formed of sound durable stone, and not less than from ten to twelve inches thick, and six feet superficial area. Other walls will be covered with coping of a similar thickness, and of seven feet or upwards superficial area. These coverings will be neatly dressed, when required, and as may be directed. The walls of the box culverts will be furnished with stones the full thickness of the wall, and the covers will be from ten to fifteen inches thick, according to the span; they must have a

bearing of at least twelve inches in each wall, and they must be fitted sufficiently close together to prevent earth falling through.

52. In second class masonry, except when dry work is intended, will be laid in full mortar, all joints flushed solid, and each course regularly and thoroughly grouted.

53. In all walls built in common lime, the exposed faces will have a four inch lipping of cement.

54. A distinction will be made between spans of twelve feet and upwards, and those of ten feet and under. The former will be of first-class masonry, and the latter, including box culverts, of second-class masonry. Centering, cofferdams, pumping and scaffolds of all kinds will be provided by the Contractors.

55. All masonry must be neatly and skilfully pointed, but if done out of season, or if from any other cause it may require re-pointing before the expiration of the contract, the Contractors must make good and complete the same at their own cost. Work left unfinished in the autumn must be properly protected during the winter, at their own risk and cost.

MISCELLANEOUS WORK.

56. After the masonry of a structure has been completed for a period of four or five weeks, the formation of the embankment around it may be proceeded with. The earth must be carefully punned in thin layers around the walls, and in this manner the filling must be carried up simultaneously on both sides. The Contractors must be extremely careful in forming the embankments around culverts and bridges, as they will be held liable for any damages to the structures that may arise. The punning must be carefully attended to, and the whole filling must invariably be done in uniform courses from the bottom to the top of the embankment,

without loading one side of the masonry more than the other.

57. The bottoms of beam culverts will be paved with stones set on edge to a moderately even face, packed solid, and the interstices filled with grout of hydraulic cement. The paving to be from 12 to 16 inches deep. In box culverts flat flags may be used for the bottom, with the side walls resting on their upper faces.

58. In places indicated by the engineer, wood culverts may be used, of flatted cedar timber, according to plans to be furnished.

BRIDGE SUPERSTRUCTURE.

All bridge and beam culverts of twenty feet span and under, will have timber superstructure of such form as may be directed, according to plans to be given and prepared, ready for the reception of the permanent way. The material to be of the best pine timber, free from shakes, knots or other imperfections. The iron in bolts, straps, &c., to be of the usual quality of iron for such purposes.

The bridges with spans exceeding twenty feet may be described as follows :

	feet
1st branch of Ottawa, or River des Prairies - length of super-structure about	950
2nd " " River Mille Isles,	800
3rd River aux Chiens,.....	100
4th River Rouge, 2 crossings	200
5th North River,.....	400
6th Calumet,.....	100
7th Rouge,.....	200
8th Salmon,.....	100
9th Nation,.....	250
10th Blanche,.....	100
11th Au Lièvre,.....	300
12th Blanche,.....	100
13th Gatineau,.....	600
14th Several minor streams,.....	400

The superstruction of the bridges to span the foregoing rivers will be designed on the Howe Truss principle, of such spans and dimensions as may be

decided by the engineer, but ranging from 100 feet to 200 feet spans, with the usual laminated arches introduced in connection with the Truss, where spans are used from 150 feet and upwards. As a rule the superstructure of the bridges must be of sufficient strength to sustain a load of one ton to each foot lineal of the span, in addition to its own weight, giving a tensile strain on the lower chords not exceeding 800 pounds per square inch, and 10,000 pounds per square inch of sectional area of the iron rods.

If an improved system of superstructure be introduced, with the top and bottom chords of wrought iron, or its bottom cord of steel or iron wire, and vertical diagonal braces of wood, the chords must possess sufficient sectional area to sustain the weight of the superstructure and a moving load of one ton to each lineal foot of span, giving a tensile strain on the lower chord of not more than 10,000 lbs. to the square inch, and a compression strain on the top chords not exceeding 8,000 lbs. to the square inch.

The timber composing the bridges must be of the best quality of square edged white oak and white pine, perfectly sound and free from sap, shakes, loose or black knots, or any other symptom of decay, and sawed or hewed in a workmanlike manner so as to form sticks when hewed and seasoned, precisely of the sizes given in the drawings to be furnished. The kind, length, sizes, &c., of the timber of the different structures must conform to the bills furnished by the engineer, and the whole must be formed and put together, in the most accurate and skilful manner, so as to secure the whole strength of the timber.

The iron in the bridges will be of the best refined Staffordshire iron, properly and mechanically made up. The threads of the nuts and bolts, to be cut by machinery, All dimensions of bolts, straps, prisms, &c., to conform to those shewn in the drawings to be furnished by the engineer. All joints of the timber to be put together in white lead and oil. After completion, and when the timber has had time

to become thoroughly seasoned, the wood work and iron work of all the bridges to receive two coats of anti-septic and anti-corrosive paint of approved quality and color.

Detailed drawings of abutments and piers of all the bridges by the engineer, will be furnished, to which the Contractors will be required to conform.

In case the piers supporting the superstructure of the bridges over certain rivers are unprovided with ice breakers, on account of want of sufficient height, suitable ice-breakers will be obtained by placing wooden cribs with sloping sides and filled with stones, in front of each pier, but at some distance above. The timber of which the cribs are composed, will be strongly dovetailed, trenailed and rag-bolted together, particularly the sheeting of the exposed sloping portions. The cribs will be filled up to the top with stones, which must be packed around the cross ties, and under the sheeting. The timber to be of cedar and pine, in sticks of 12 inches square, counterhewn on the outside and neatly finished to the satisfaction of the engineer.

In putting in coffer-dams, in building the scaffolds or in doing other work in connection with the bridges, the Contractors must not interfere with the free passage of vessels, saw logs, timber, rafts, or of water to mills or factories, and in the event of creating damage in that respect they must be responsible to the parties so injured.

On the completion of the bridges or other mechanical structures, or buildings, all coffer-dams, scaffolds and rubbish must be removed by the Contractors, to the entire satisfaction of the engineer.

PERMANENT WAY OF SUPERSTRUCTURE.

The gauge of the road will be four feet eight and one half inches. The rails will weigh at least sixty pounds to the yard, and be fish-plated and secured to ties in the most approved and modern manner.

The iron rails shall be of the best quality of English or American manufacture, and of the form and pattern that may be decided upon by the engineer. The spikes, fish-plates, bolts, &c., shall be of the first quality of Staffordshire refined iron, and of approved dimensions and form.

Should steel rails be adopted, they will weigh 56 lbs. to the yard.

The ties may be of white ash, tamarack, oak, rock elm, or other suitable sound wood—eight feet long, hewn or sawn on two parallel sides so as to give a width of eight inches face—with a thickness of seven inches, and entirely out of winding. The ties will be laid at right angles to the line of railway, and will be bedded in the ballast flush with the final grade of the road. They will be well rammed down to a firm and continuous bearing, and the tops dressed off to a level and uniform surface to receive the rails. The ties will be laid two feet apart from centre to centre, or 2,640 per mile.

When required by the engineer, the rails shall be bent to correspond with the curve of the road, and all rails for tangent lines, before being laid permanently, shall be straightened and taken out of wind: side tracks are to be laid at the termini and way-stations. These tracks will be of such length as shall be directed by the engineer, and will not exceed in the aggregate length ten per cent of the length of the main line, to be furnished with the necessary frogs, points and crossings, switches, signal levers, wire-rope, &c., in a similar manner to those used in the Great Western Railway. The track to be laid under the guidance of the engineer or of persons appointed by him, and in strict accordance with the plans and instructions emanating from him. All condemned materials shall be removed from the track to such distance as shall be directed by the engineer, in order to prevent their being used in the work. No rails will be allowed to be laid in the permanent track that have been used by the Contractor, during construction, and injured in any respect.

BALLASTING.

The material to be used for raising the road-bed to the final or full grade, or "ballasting the road," shall consist of coarse sand or free gravel, to be approved by the engineer before being used upon the road. When material suitable for the purpose occurs in the excavation for the road-bed, or in close proximity to the road, the ballasting is to be done previously to the track being laid, for a distance each way of half a mile from the point of construction. When fitting material is not to be had as above, the track is to be laid at "sub-grade," and well packed up with clay, &c., to prevent injury to the rails, and subsequently be raised to full grade level, the material for which will be hauled over the rail. In lifting the rail to full grade, care must be observed to make it conform to the levels given by the engineer, and to preserve perfect alignment. In curves, the outer rail will be elevated as directed and the ballast sloped and dressed off in a neat manner. The quantity of ballast to equal 2,000 cubic yards per mile,

The rail will be at least one foot six inches above formation level and the top of the ballast ten feet in width with side slopes of one foot horizontal to one foot perpendicular.

ROLLING STOCK.

The following will be the Rolling Stock required :

- 6 Express Locomotive Engines,
- 10 Freight "
- 12 First Class Carriages,
- 30 Second Class "
- 5 Express and Post Office Carriages,
- 100 Freight Box Cars,
- 100 Platform Cars.
- 5 Snow Ploughs,
- 10 Hand Cars.

The above engines and carriages will be the best of their respective kinds, and constructed in accord-

ance with detailed drawings and specifications to be furnished to the Contractors.

TELEGRAPH.

A telegraph line carrying a single wire will be built by the Contractors, the entire length of the line. The poles will be of cedar, with distance apart and depth in the ground similar in all respects to the Montreal Company's line: the wire, insulators, and working apparatus for each station will be complete in every respect for working.

GENERAL CLAUSES.

All materials intended to be used in the construction of the work in the foregoing specification, must be examined and approved by the engineer of the Company, before being used. The whole work to be done in a workmanlike manner subject to the constant supervision, inspection and acceptance of the engineer, or of some person appointed by him for that purpose. The engineer shall be the sole judge of the quality and quantity of the work, and his decision and admeasurement of the same shall be final and conclusive between the Railway Company and the Contractors. The term earth work shall comprise all excavations with the exception of solid rock and loose stones measuring one half of a cubic yard and upwards.

The details of the character, proportions and dimensions of the work will be represented upon the plans, sections and bills of quantities which will be from time to time furnished.

It is understood that the section of the railway at present in existence, is but an approximate one founded on the preliminary surveys in so far as they have extended. Some twenty-five miles in length from the Aylmer end in the direction of Montreal, have not yet been levelled over, but from examination, the country presents no engineering difficulties

When the projected line is located on the ground, the profile or section then obtained for the centre line of railway to be built, may vary somewhat from the preliminary one now exhibited: the present proposed line may also be varied in localities, either to shorten the entire distance between Aylmer and Montreal, or, for the purpose of easing the grades. Between Ste. Thérèse and Grenville, the line may be carried *viâ* St. Andrews, or *viâ* Lachute, as may be determined by the Company. In the event of the first route being selected, a section of the Carillon and Grenville Railway will be adopted, and will require to be repaired and put in good condition by the Contractors. The track will be laid with new rails, and those now in use employed for sidings on the main line.

The prices mentioned in the Tender and Contract to cover the cost of executing the several items of work. Payments to be made monthly on the estimates of the engineer as the work progresses, less ten per cent, until the total of said percentage amounts to the sum of one hundred thousand dollars, which will be reserved by the Company to insure the completion of the contract. The Contractor will be held responsible for the good and substantial quality of the entire work, for a period of one year after the completion and delivery to the Company.

The work to be commenced immediately after signing the Contract, and completed on or before the first day of October, 1875.

CHARLES LEGGE,
Engineer-in-Chief, M. N. C. R.

Countersigned,

E. LEF. DE BELLEFEUILLE,
Secretary, M. N. C. R.

MONTREAL, 15th March, 1873.

und,
entre
from
sent
ther
and
ides.
y be
y be
the
llon
l re-
a by
new
s on

ract
s of
esti-
less
tage
ars,
sure
will
ntial
year
ny.

after
fore

. R.

. R.

DATE LIMITE

19-102-66			